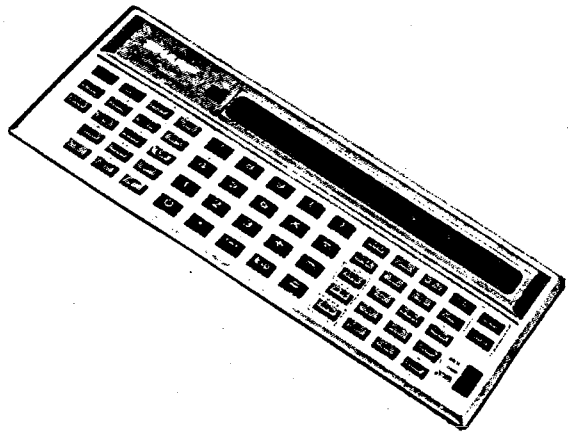
SHARP

SERVICE MANUAL



MODEL EL-5100

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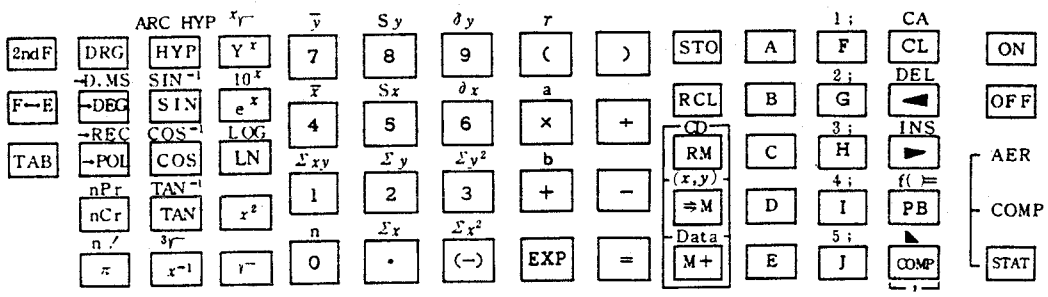
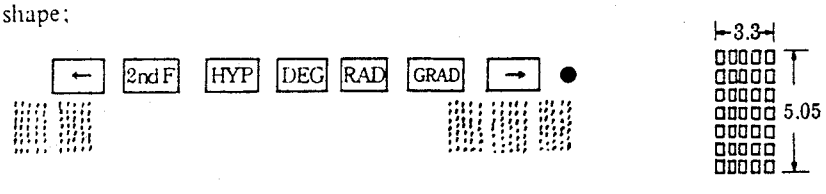
1. SPECIFICATIONS

- **Key's Layout**



- **Display Section**

  Display shape:



Display system; Dot matrix liquid crystal display (LCD1601J)

Display capacity; 24 digits (algebraic operation system)
(numeral ... mantissa 10 digits, exponents 2 digits)

Symbols;

2ndF Second function designation sysmbol

HYP Hyperbolic function mode symbol

DEG, RAD, GRAD } Angular mode symbols

← Appears, when there exists anything to be displayed t the left of the displayed contents of an algebrai formula.

→ Appears, when there exists anything to be displayed t the right of the displayed contents of an algebrai formula.
Appears also to indicates that the machine is in opera tion when it is executing a calculation.

• Battery indicator
The battery indicator is a grey dot located in the righ of the display. When this dot is not on, the batteri must be replaced.

- **Calculations**

Four arithmetic calculations, trigonometric and inverse trigonometric functions, hyperbolic an liverse hyperbolic functions, angular conversion, reciprocal, square and cube root, square an power, logarithmic and exponential, Xth root of Y ($\sqrt[x]{y}$), factorial, permutation, combinatio coordinate conversion, memory, and statistical calculations.

General calculation capacity; 80 steps

Algebraic expression reserve; Capacity: 80 steps (AER mode)
Functions: Cursor step-up, step-down, insertion, deletio playback.

- **Others**

Overflow errors;

1. When the absolute value of a calculation result is great than $9.999999999 \times 10^{99}$.
2. When a number is divided by 0 (zero). (A ÷ 0).
3. When the absolute value of a result of memory calcul.. .n greater than $9.999999999 \times 10^{99}$.
4. When a formula that exceeds the capacity of function (1 stage) or data (8-stage) buffer is used for calculation.
5. When a formula gramatically wrong is executed.
6. When date for both 1-variable and 2-variable statistical c culations are input at random in the STAT mode.

Error symbol; . . . . . □ . . . . .

Memory; 11

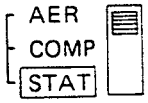
Power supply; Silver oxide battery (G-13 x 3)

Battery life; Approx. 1000 hours

Dimentions; 175(W) x 70(D) x 9.3(H)mm

Weight; Approx. 120g.

2. MAIN KEY'S EXPLANATION



Mode selector

AER: Algebraic Expression Reserve mode
This mode is used to store algebraic formulas into the calculator.
In this mode, any calculation is not performed.

COMP: Compute mode
This mode permits the calculator to perform (except for statistical calculation) all sorts of calculations including four arithmetic calculations, scientific calculations and calculations that utilize stored algebraic formulas in the AER mode.

STAT: Statistical calculations mode
The statistical program will be activated.

[2ndF] **2nd function designation key**

- This key is to be operated when designating the second function (labeled in mustard) of the function keys. (i.e. LOG, COS^{-1}, etc.). When the 2nd function is designated, the 2nd function designation symbol (2nd F) is displayed.

  [2ndF] [LOG / LN] 23 → log 23

  [2ndF] [COS^{-1} / COS] .5 → $\cos^{-1}$ 0.5

- The [2ndF] key is of reversing type, and if it is pushed by mistake the 1st function can be designated by pushing the key once more.

  Ex. [2ndF] [SIN^{-1} / SIN] → $\sin^{-1}$ (Designation of 2nd function)

  [2ndF] [2ndF] [SIN^{-1} / SIN] → sin (Designation of 1st function)

[F↔E] **Display format exchange key**

When a calculation result is displayed in the floating decimal point system, pushing the key displays the result in the scientific notation system.
Pushing the key once more displays the result in the floating decimal point system again.
This key operations does not work in the AER mode.

[TAB] **Tabulation key**

This key specifies the number of decimal digits in the calculation results.
The number of decimal digits is specified by numeral key ([0] ~ [9]) depressed after the [TAB] key.
To set the floating decimal, depress the [TAB] [•] keys.

Ex. COMP mode

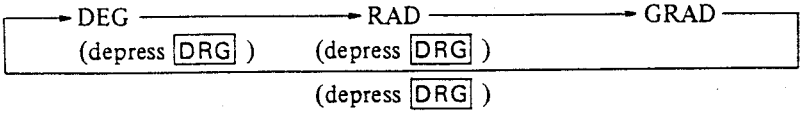
[CL] [TAB] [3] (Decimal position: 3)
50 [÷] 9 [=] → 5.556
5 [÷] 2 [=] → 2.500
[TAB] [•] (Floating decimal)
50 [÷] 9 [=] → 5.555555556
5 [÷] 2 [=] → 2.5

Note: This key operation is ineffective right after or in the course of entry of a number and in the AER mode.

[DRG] **Degree/Radian/Grad selection key**

Used for calculation of trigonometric, inverse trigonometric and coordinate conversion.

The [DRG] key changes the angular mode.



Ex. DEG → GRAD: Depress the [DRG] key twice. ([DRG] [DRG])

[STO] **Store key**

The EL-5101 has five (5) store memory registers. To designate each memory, depress the [STO] key followed by [A] ~ [J] (Ex. [STO] [A])

AER mode:

Designates the instruction to store a number into the designated store memory.

COMP mode:

Depression of the [STO] and [A] ~ [J] key clear a number in the designated memory and then stores a number being displayed or calculated result in the designated memory.

[RCL] **Recall key**

Recall the contents of the designated memory. To designate each memory, depress [A] ~ [J] keys following the [RCL] key. (Ex. [RCL] [A]). The contents of the store memory remain unchanged after this operation.

AER mode:

The contents of the store memory are written as a constant in the formula.

COMP mode:

When the formulas are displayed, the contents of the store memory are written in the formulas.

When the calculated result is displayed, the contents of the store memory are displayed.

[A] ~ [E] **Store memory keys**

AER mode, COMP mode:

When the [A] ~ [J] keys are depressed following the [STO] or [RCL] key, corresponding store memories are designated.

[2ndF] [F] (1;) ~ [J] (5;) **Formula keys**

AER mode; Displays the formulas in each area.

COMP mode; Used to perform the calculation according to the algebraic formula stored in each area in the AER mode.

[CD] [RM] [RM]: **Recall memory and correct data key**

Recalls the contents of the independently accessible memory.

COMP mode:

When the formula is displayed, the contents of the independently accessible memory is written in the formula.

When the calculated result is displayed, the contents of the independently accessible memory is displayed.

AER mode:

The contents of the independently accessible memory are written as a constant in the formula.

[CD]: STAT mode:

Used to correct the mis-entry of data.

(x, y)
⇒M

Memory-in-two variable data designation key

⇒M : AER mode:

Designates the instruction for storing the number in the display or calculation result into the independently accessible memory.

: COMP mode:

Clear the contents of the independently accessible memory and replaces it with the number in the display or calculated result. To clear the memory depress the CL key followed by the ⇒M key.

(x, y) : STAT mode:

Used to distinguish data x and data y in the two-variable statistical calculation.

Ex. When data x is 6 and data y is 3.

Key operation 6 (x, y) 3 Data

Data
M+

Memory plus/enter data key

M+ : AER mode:

Designates the instruction for storing the number displayed or a calculated result to the independently accessible memory.

COMP mode:

Used to add the number displayed or a calculated result to the contents of the independently accessible memory.

2ndF
M+ : AER mode:

Designates the instruction to subtract the displayed number or a calculated result from the independently accessible memory.

COMP mode:

Used to subtract the displayed number or a calculated result from the contents of the independently accessible memory.

Note; When the 2NDF M+ keys is depressed, the "M−" will be displayed.

Data : STAT mode:

Used to enter data in one-variable statistical calculation or data in two variable statistical calculation.

CA
CL

Clear/clear all key

CL : AER mode:

Orders the cursor to be positoned at 0th step of algebraic expression reserve area.

COMP mode:

Clears the contents of the calculation registers. The contents of the memory and stored algebraic formula are not affected. Clears the error condition.

STAT mode:

Clears the contents of the calculation registers. The entry data for the statistical calculation is retained. And clears the error condition.

2ndF
CA : AER mode:

Clears all of information stored in algebraic expression reserve area.

COMP mode:

Clears the contents of the calculation registers. The contents of the memory and stored algebraic formula are not affected.

STAT mode:

Clears the entry data or calculated result of the statistical calculation. The stored algebraic formulas are retained.

DEL ◄

Cursor step-down and delete key

◄ : Makes the cursor go down by one step.

2ndF DEL : Deletes the symbol (instruction) stored in the step indicated by the cursor. (The cursor does not move.)

INS ►

Cursor step-up and insert key

► : Makes the cursor go up by one step.

2ndF INS : Provides a blank necessary for insertion of an instruction in the step indicated b cursor.

Pushing the 2ndF and INS keys in this sequence shifts to the right the contents step indicated by the cursor and the subsequent. In the blank step appears the insert " ⎵ ".

Ex.	Key operation	Display	Remarks
		2 + 3 x 4	3: Blinking
	2ndF INS	2 + ⎵ 3 x 4	⎵ : Blinking

f()= PB

Play back and variable designation key

PB : Displays an inputted formula (or number) in sequence, divided into some part of which can be displayed at a time. In the COMP- or STAT-mode, this key recal formulas that was performed last.

2ndF f()= : In the AER mode, the combination specifies a variable when writing a formula nec for performing a calculation in dialogic form.

For example, the key operation 2ndF f()= A B 2ndF f()= writes "f(AB)= designates A and B to variables.

COMP ,

Compute and comma key

COMP : COMP mode:

Executes a calculation according to a stored formula in the AER mode.

, : AER mode:

Inserts a comma between formulas to distinguish them from each other when storii or more formulas in the divided area.

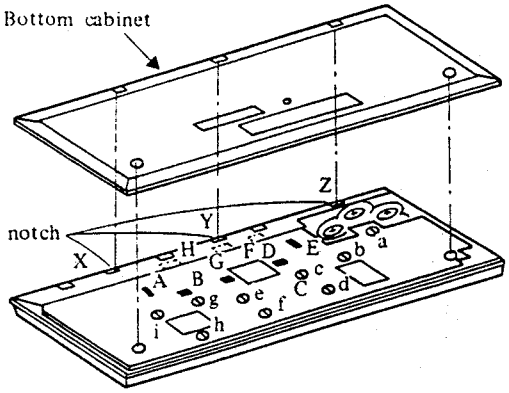
2ndF ► AER mode;

Used to put on end to each formula reserve area.

Note: Do not depress 2ndF ► keys at the end of the 5th area. Other wise an error will take place.

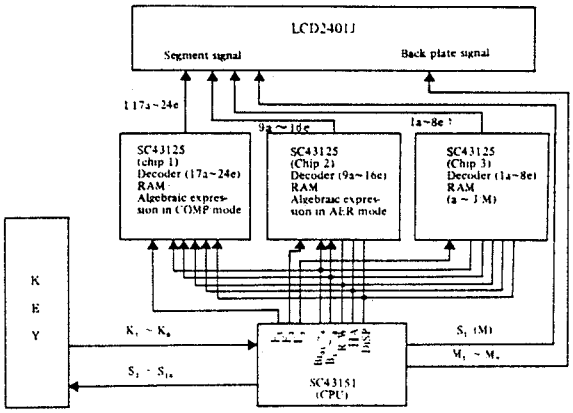
3. DISASSEMBLY PROCEDURE

1. Remove two screws on the bottom cabinet.
2. Detach the bottom cabinet from the top cabinet as it is clasped to the top cabinet at the points, X, Y, and Z.
3. Take batteries out (3 pcs).
4. Remove nine screws at the points a ~ i.
5. Detach the P.W.B. from the top cabinet by lifting the lower part of the P.W.B., as it is hooked to the top cabinet at the upper part (LCD side).
6. As soon as the P.W.B. was removed, such as the key rubber and filter are ready to remove.
7. Now, dismount the LCD unit by releasing the hooks, as it is hooked to the P.W.B. at eight locations A ~ H.



8. Then, the contact rubbers can be removed when the LCD unit was removed.
9. As the LCD is held to the angle using a double-tack adhesive tape, pour in a small amount of alcohol into the contact phase between the LCD and the angle. This will make separation of the LCD much more easier.

4. BLOCK DIAGRAM



- Key Section
  Key signals are sent to the LSI as key signals $Ki_1 \sim Ki_{16}$. while key strobe signals are sent from the SC43151 as key strobe signals $S_2 \sim S_{16}$.
- Arithmetic Logic Section
  All the arithmetic operations are carried out in the SC43150 on the basis of key signals $Ki_1 \sim Ki_{16}$. However, some part of the 1K RAM within the display chip (SC43125) is used for the memory of the SC43150, exchanging the data corresponding to the address bus ($B_1 \sim B_8$) via $Di_{01} \sim DI_{04}$.
- Display Section
  When the signal Chip Enable is in high state, the display data is received into the designated address ($B_1 \sim B_8$) of the SC43125 via the lines $Di_{01} \sim Di_{04}$.
  Though the display data is decoded into one of signals 1a ~ 24e by the decoder in the SC43125, it is then controlled by the signal HA for synchronizing with the back plate signal. If the signal Disp is in high state (out of arithmetic operation), the decoded signal 1a ~ 24e is sent to the LCD as a segment signal so that segments are lit corresponding to the back plate signal $H_1 \sim H_7$ directly received from the SC43151.

5. LSI SIGNALS

• SC43150

Pin No.	Signal Name	IN/OUT	Description
1	F4		Nonconnection
2	F3		Nonconnection
3	F2	OUT	Display chip 2 enable signal
4	F1	OUT	Display chip 1 enable signal
5	VDD	IN	Power source
6	VGG	IN	Power source
7	XOUT	IN	For internal CG
8	XIN	IN	For internal CG
9	TEST1	IN	LSi checking terminal
10	TEST2	IN	LSi checking terminal
11	RESET	IN	LSi reset signal
12	R/W	OUT	Read out/Write in control input
13	Di04	IN/OUT	Data buss
14	Di03	IN/OUT	Data buss
15	Di02	IN/OUT	Data buss
16	Di01	IN/OUT	Data buss
17	B8	OUT	Chip address
18	B7	OUT	Chip address
19	B6	OUT	Chip address
20	B5	OUT	Chip address
21	B4	OUT	Chip address
22	B3	OUT	Chip address
23	B2	OUT	Chip address
24	B1	OUT	Chip address
25	HA	OUT	Counter signal for display chip
26	DiS	OUT	Display control signal
27	VM	IN	Power source
28	VA	IN	Power source
29	GND	IN	Power source
30	H4	OUT	LCD back plate signal
31	H7	OUT	LCD back plate signal
32	H3	OUT	LCD back plate signal
33	H6	OUT	LCD back plate signal
34	H2	OUT	LCD back plate signal
35	H5	OUT	LCD back plate signal
36	H1	OUT	LCD back plate signal
37	VDISP	IN	Power source for display
38	VB	IN	Power source
39	S16	OUT	Key strobe signal
40	S15	OUT	Key strobe signal
41	S14	OUT	Key strobe signal
42	S13	OUT	Key strobe signal
43	S12	OUT	Key strobe signal
44	S11	OUT	Key strobe signal
45	S10	OUT	Key strobe signal

Pin No.	Signal Name	IN/OUT	Description
46	S9	OUT	Key strobe signal
47	S8	OUT	Key strobe signal
48	S7	OUT	Key strobe signal
49	S6	OUT	Key strobe signal
50	S5	OUT	Key strobe signal
51	S4	OUT	Key strobe signal
52	S3	OUT	Key strobe signal
53	S2	OUT	Key strobe signal
54	S1	OUT	LCD segment signal
55	Ki1	IN	Key input signal
56	Ki2	IN	Key input signal
57	Ki3	IN	Key input signal
58	Ki4	IN	Key input signal
59	Ki5	IN	Key input signal (Mode key)
60	Ki6	IN	Key input signal (ON key)

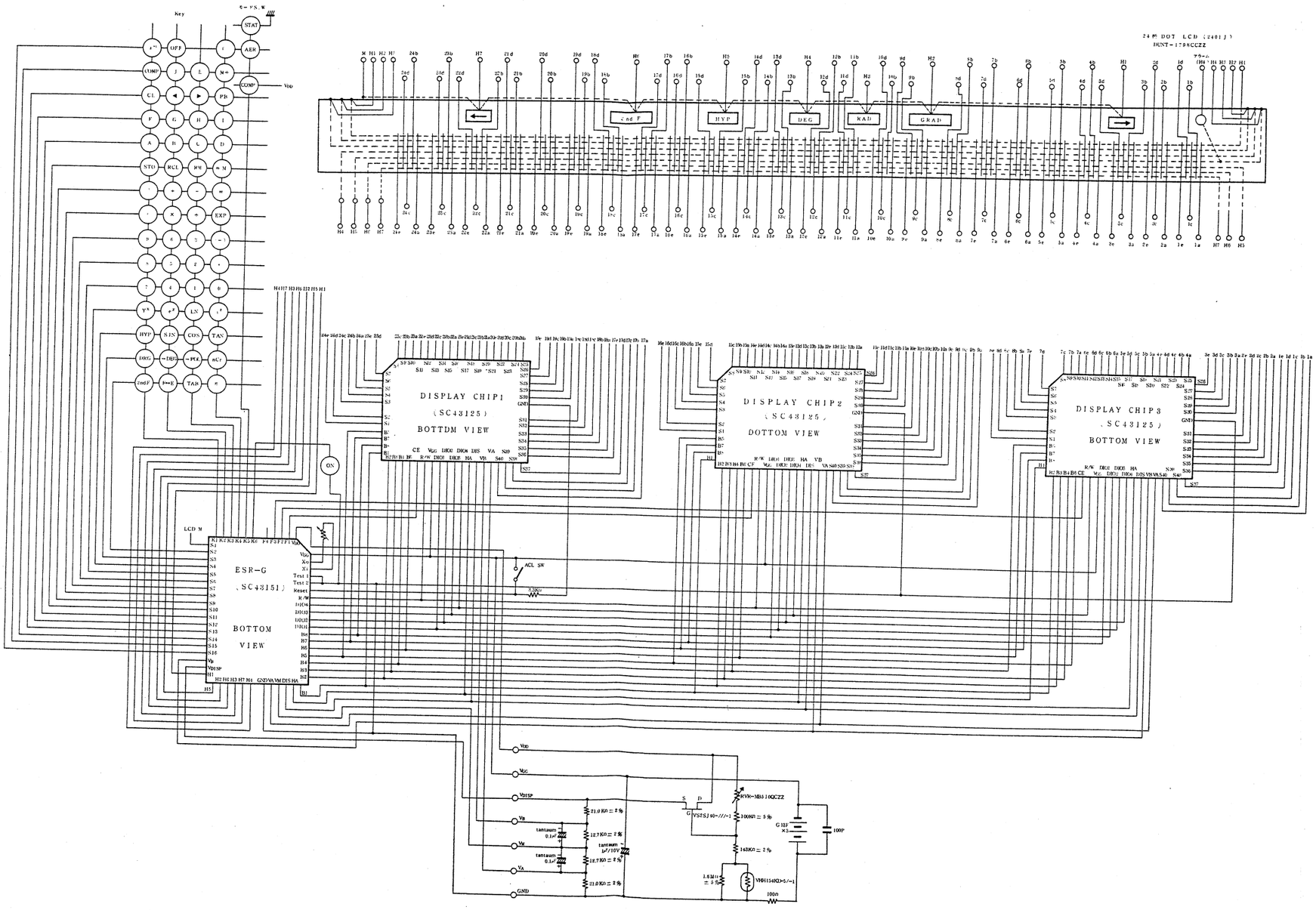
● **SC43125**

Pin No.	Signal Name	IN/OUT	Description					
1	S3	OUT	LCD segment signal	16c	CHIP 2	8c	CHIP 3	24c
2	S4	OUT	LCD segment signal	16b		8b		24b
3	S5	OUT	LCD segment signal	16a		8a		24a
4	S6	OUT	LCD segment signal	15e		7e		23e
5	S7	OUT	LCD segment signal	15d		7d		23d
6	S8	OUT	LCD segment signal	15c		7c		23c
7	S9	OUT	LCD segment signal	15b		7b		23b
8	S10	OUT	LCD segment signal	15a		7a		23a
9	S11	OUT	LCD segment signal	14e		6e		22e
10	S12	OUT	LCD segment signal	14d		6d		22d
11	S13	OUT	LCD segment signal	14c		6c		22c
12	S14	OUT	LCD segment signal	14b		6b		22b
13	S15	OUT	LCD segment signal	14a		6a		22a
14	S16	OUT	LCD segment signal	13e		5e		21e
15	S17	OUT	LCD segment signal	13d		5d		21d
16	S18	OUT	LCD segment signal	13c		5c		21c
17	S19	OUT	LCD segment signal	13b		5b		21b
18	S20	OUT	LCD segment signal	13a		5a		21a
19	S21	OUT	LCD segment signal	12e		4e		20e
20	S22	OUT	LCD segment signal	12d		4d		20d
21	S23	OUT	LCD segment signal	12c		4c		20c
22	S24	OUT	LCD segment signal	12b		4b		20b
23	S25	OUT	LCD segment signal	12a		4a		20a
24	S26	OUT	LCD segment signal	11e		3e		19e

CHIP 1

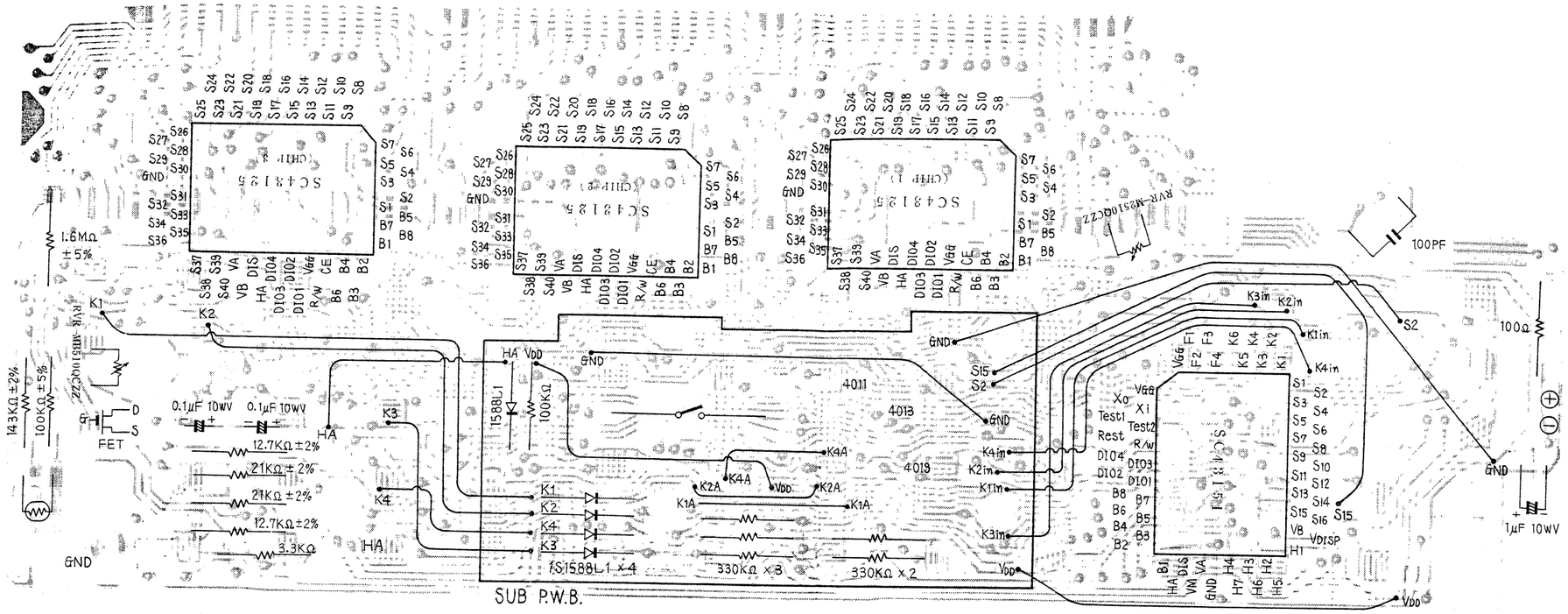
Pin No.	Signal Name	IN/OUT	Description				
25	S27	OUT	LCD segment signal	11d	3d	19d	
26	S28	OUT	LCD segment signal	11c	3c	19c	
27	S29	OUT	LCD segment signal	11b	3b	19b	
28	S30	OUT	LCD segment signal	11a	3a	19a	
29	GND	IN	Power source 0V				
30	S31	OUT	LCD segment signal	10e	2e	18e	
31	S32	OUT	LCD segment signal	10d	CHIP 2 2d	CHIP 3 18d	CHIP 1
32	S33	OUT	LCD segment signal	10c	2c	18c	
33	S34	OUT	LCD segment signal	10b	2b	18b	
34	S35	OUT	LCD segment signal	10a	2a	18a	
35	S36	OUT	LCD segment signal	9e	1e	17e	
36	S37	OUT	LCD segment signal	9d	1d	17d	
37	S38	OUT	LCD segment signal	9c	1c	17c	
38	S39	OUT	LCD segment signal	9b	1b	17b	
39	S40	OUT	LCD segment signal	9a	1a	17a	
40	VA	IN	Power source				
41	VB	IN	Power source				
42	DiS	IN	Display control signal				
43	HA	IN	Control signal				
44	Di04	IN/OUT	Data buss				
45	Di03	IN/OUT	Data buss				
46	Di02	IN/OUT	Data buss				
47	Di01	IN/OUT	Data buss				
48	VGG	IN	Power source				
49	R/W	IN	Read out/Write in control signal				
50	CE	IN	Chip-enable				
51	B6	IN	Chip address				
52	B4	IN	Chip address				
53	B3	IN	Chip address				
54	B2	IN	Chip address				
55	B1	IN	Chip address				
56	B8	IN	Chip address				
57	B7	IN	Chip address				
58	B5	IN	Chip address				
59	S1	OUT	LCD segment signal	16e	CHIP 2 8e	CHIP 3 24e	CHIP 1
60	S2	OUT	LCD segment signal	16d	8d	24d	

6. CIRCUIT DIAGRAM

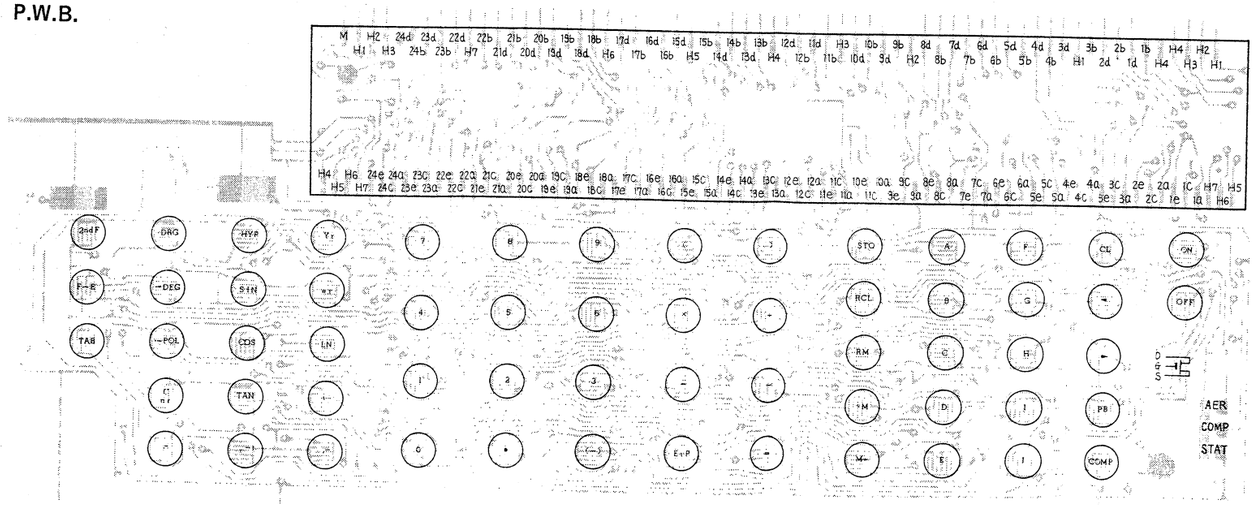


7. PARTS & SIGNALS POSITION

a) Main P.W.B.



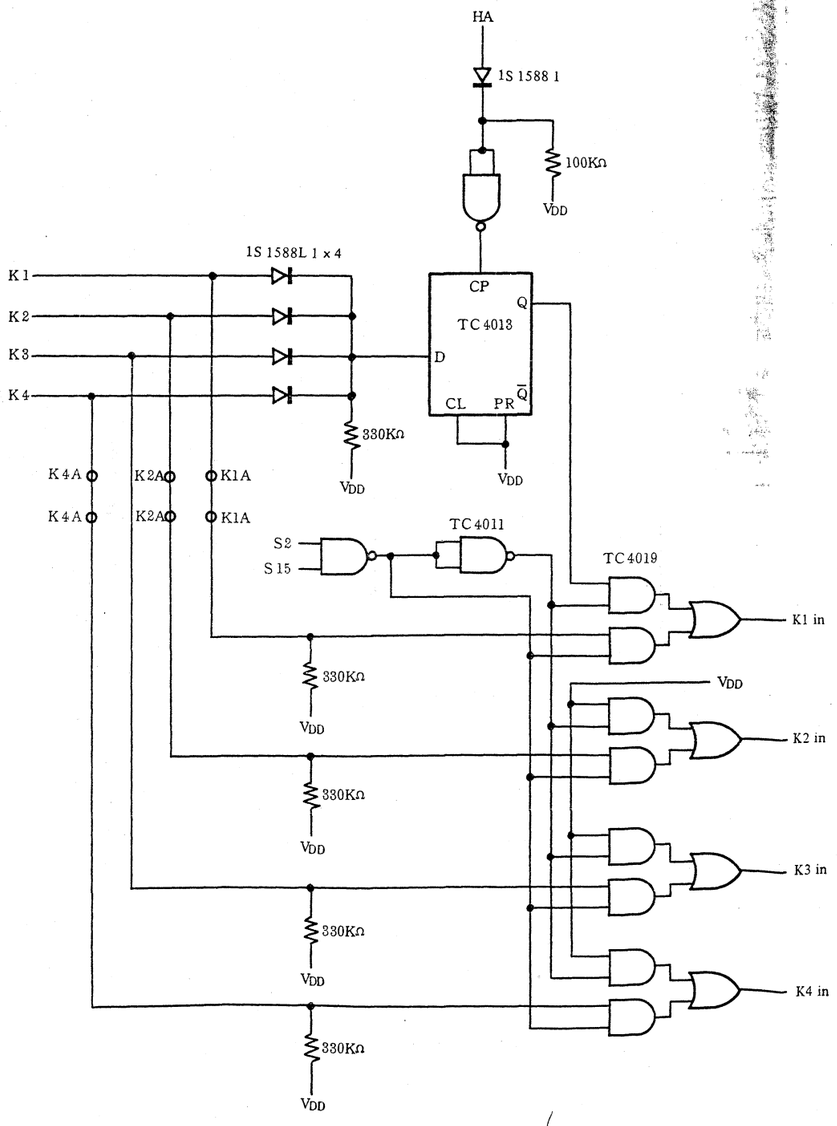
b) KEY P.W.B.



SUB. P. W. B.

The circuit contained in this Sub P. W. B. will be fabricated in the L. S. I. itself. Therefore, use of this Sub P. W. B. will be abolished from the July production, 1979.

本回路は7月生産分よりLSIの内部に組込まれます。従って当SUB PWBは7月生産分（新LSI使用分）より廃止となります。



8. PARTS LIST

NO.	PARTS CODE	DESCRIPTION	NEW MARK	PRICE RANK
1	CCABB2114CC01	Top cabinet	N	A S
2	PFiLW1228CCZZ	Display filter		A C
3	HDECA1527CCZZ	Dec. panel for display	N	A C
4	PFiLW1230CCZZ	Filter	N	A H
5	PSPAP1121CCZZ	Switch spacer		A A
6	JKNBZ1256CCZZ	Knob for slide switch		A B
7	QCNTM1034CCZZ	Contact for slide switch		A A
8	MSPRC1098CCZZ	Earth spring		A A
9	JKNBZ1492CC01	Key top (20key)		A E
10	JKNBZ1493CC01	Key top (2nd F key) for 30sets		A E
11	JKNBZ1494CC01	Key top (CL key) for 30sets		A E
12	JKNBZ1495CC01	Key top (function key) for 2sets		A F
13	JKNBZ1495CC03	Key top (A～J key etc.) for 2sets	N	A F
14	JKNBZ1495CC04	Key top (ON, OFF, F↔E, TAB) for 6sets		A F
15	JKNBZ1495CC05	Key top (COMP, PB, ▶, ◀) for 6sets	N	A F
16	PGUMM1185CCZZ	Key rubber		A L
17	LANGK1290CCZZ	L. C. D angle	N	A D
18	DUNT−1179BCCZZ	L. C. D	N	A Z
19	PGUMS1190CCZZ	Rubber connecctor	N	A E
20	QTANZ1249CCZZ	Battery terminal (+)		A B
21	QTANZ1250CCZZ	Battery terminal (−)		A B
22	QTANZ1251CCZZ	Battery terminal (+, −)		A B
23	QCNTM1036CCZZ	Contact		A B
24	PZETL1273CCZZ	Battery insulating sheet		A C
25	HDECA1526CCZZ	Bottom panel	N	A K
26	LX−BZ1060CCZZ	Screw		A A
27	LX−BZ1061CCZZ	Screw		A A
28	UBAGZ1169CCZZ	Hard case		
29	TiNSE2445CCZZ	Instruction book (U. S. A only)	N	
	TiNSM2446CCZZ	Instruction book (E, F, G, S)	N	A T
30	SPAKC4296CCZZ	Packing case (U. S. A only)	N	A C
	SPAKC4299CCZZ	Packing case (except U. S. A)	N	A C
31	TLABZ1295CCZZ	Name label		A A
	RC−KZ1007CCZZ	Capacitor 1000PF		A B
	RC−SZ1006CCZZ	Capacitor 0.1μF		A F
	RC−SZ1007CCZZ	Capacitor 1μF		A F
	RR−DZ1006CCZZ	Resistor 1/8W 143Kohm ±2%		A B
	RR−DZ1007CCZZ	Resistor 1/8W 12.7Kohm ±2%	N	A B
	RR−DZ1008CCZZ	Resistor 1/8W 21Kohm ±2%	N	A B
	RVR−MB510QCZZ	Variable resistor		A E
	RVR−M2510QCZZ	Variable resistor		A D
	VHH154KD−5/−1	Thermistor		A C
	VHiSC43125/−1	L. S. i		A X
	VHiSC43151/−1	L. S. i	N	B F
	VRC−MT2BG101K	Resistor 1/8W 100ohm ±10%		A A
	VRC−MT2BG165J	Resistor 1/8W 1.6Mohm ±5%		A A
	VRD−ST2BY104J	Resistor 1/8W 100Kohm ±5%		A A
	VRD−ST2BY332J	Resistor 1/8W 3.3Kohm ±5%		A A
	VS2SJ40−///−1	Transistor		A G
※ A	DUNTK5088CSZZ	Sub P.W.B unit		
B	LX−BZ1072CCZZ	Screw for sub P.W.B		

※A, B; These parts will be abolished from the July production, 1979.

9. PARTS GUIDE